

IN THE SPECIFICATION:

Please replace the paragraph beginning on page 14, line 33, and ending on page 15, line 9 with the following amended paragraph:

To assist in the description of the deposition on the seed layer, the FIG. 6 progression (including FIGs. 6A to 6F) is provided to show different stages of a metal deposited layer [604] 614 forming on the seed layer 15. The seed layer 15 shown in FIGs. 2A, 2B, and 6A to 6F is described as separate from the metal deposited on the seed layer. The seed layer 15 and the subsequent deposited layer are typically formed from the same metal (for example copper), and a material-based boundary between the seed layer and the subsequent metal deposition does not exist. The seed layer 15 is shown as a separate layer from the subsequent metal deposition to indicate the depth of the metal deposition at different locations. FIG. 6A shows the seed layer 15 formed on walls 206, bottom 208, and horizontal surface 204. No metal deposition has formed on the seed layer in FIG. 6A. A process, such as PVD or CVD, applies the seed layer 15. The process is performed before the substrate is inserted in the ECD system.

Please replace the paragraph beginning on page 8, line 10 and ending on line 18 with the following amended paragraph:

Electrolyte solution is supplied to electrolyte cell 12 via electrolyte input port 80. The displaced electrolyte solution in the electrolyte cell 12 flows over the annular weir portion 83 into an annular catch 85, that in turn drains into electrolyte output 88 that is fluidly coupled to a recirculation/refreshing system 87. The recirculation/refreshing system 87 refreshes the chemistry of the electrolyte solution to a level that is suitable for electroplating, then recirculates the electrolyte solution into the electrolyte cell 12. The refreshed electrolyte solution output from the recirculation/refreshing system 87 is applied to the inlet port 80 of the electrolyte cell 12 through an electrolyte input 82 to define a closed loop for the electrolyte solution, as now described.

Please replace the paragraph beginning on page 3, line 13 and ending on line 27 with the following amended paragraph:

D3 FIG. 2A shows a portion of a substrate 200 having a feature 202 formed therein. The feature 202 includes walls 206 and bottom 208. Outside of the feature is a horizontal surface 204. A throat 212 defines the opening of the feature 202 is formed between walls 206, on the opposed side of each features 202. The seed layer 15 is applied over the horizontal surface 204, the walls 206, and the bottom 208. Metal ions deposit on the seed layer 15. Non-uniformity in the deposited thickness of the metal layer on the walls 206 and the bottom 208 of the feature, and the horizontal surface 204 results because of minute sizes of the features, the different angular orientations of the different feature surfaces, and the increased charge density at the edges and corners of the features. Metal ions suspended in the electrolyte solution have difficulty entering the small feature due to the feature's small throat. The features have especially small entrance dimensions when the throat is closing off. Therefore, the concentrations of metal ions in the electrolyte solution within the features are lower than the concentration of metal ions in the electrolyte solution outside of the feature. This lower concentration of metal ions in the feature results in a lower deposition rate in the features.

Please replace the paragraph beginning on page 15, line 10 and ending on line 30 with the following amended paragraph:

D4 The step 1 current 311 involves the electricity applied to the substrate 200 before and during the initial immersion of the substrate into the electrolyte solution. During the immersion process represented as step 1, only a certain percentage of the seed layer 15 is immersed in the electrolyte solution. Many embodiments of substrate holders 14 "rotate" the substrate between 1 and 50 RPM as the substrate is immersed in the electrolyte solution. Since only a percentage of the substrate plating surface is immersed in the electrolyte solution, the plating current density level from the anode to the cathode is relatively low during step 1. The low deposition rate across all portions of the seed layer 15 during the immersion process is desired since otherwise, metal would be deposited only on those portions of the seed layer 15 on the substrate that have been instantaneously immersed in the electrolyte solution. Such metal deposition

D4
Contd

occurs on certain seed layer portions, but not others. Even brief immersion (with a considerable current density applied to the substrate) may lead to a non-uniform deposition across the surface of the seed layer. During step 1, the cathode/substrate seed layer is biased with a negative voltage relative to the anode ranging from about 1 to 5 volts to provide a slight plating current to the plating surface. This slight plating current limits etching of the seed layer 15 by the electrolyte solution that has a low pH (a low pH indicates the electrolyte solution is acid). Following the complete immersion of the substrate into the process position, step 2 is commenced. Step 1 is used to insert the substrate into the electrolyte solution with limited uneven deposition applied in combination with limited (or no) etching.

Please replace the paragraph beginning on page 8, line 29 and ending on page 9, line 2 with the following amended paragraph:

D5

The main electrolyte tank 502 provides a reservoir for electrolyte and includes an electrolyte supply line 512 that is connected to electrolyte cell 12 through one or more fluid pumps 508, 530 and valves 507. A heat exchanger 524 or a heater/chiller disposed in thermal connection with the main tank 502 controls the temperature of the electrolyte stored in the main electrolyte tank 502. The heat exchanger 524 is connected to and operated by the controller 510.